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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/658,639	LEE ET AL.	
	Examiner	Art Unit	
	LI LIU	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 May 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6 and 9-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6 and 9-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Response to Arguments

1. Applicant's arguments filed 05/09/2008 have been fully considered but they are not persuasive. The examiner has thoroughly reviewed Applicant's amendment and arguments but firmly believes that the cited reference reasonably and properly meet the claimed limitation.

Applicant's argument – "Contrary to the Examiner's position regarding the incorporation of a TFF in place of a DFF, applicant submits that the use of TFF causes the frequency or bit rate of the output signal to be half that of the input NRZ signal.

That is, the Q output of a D-flip-flop always takes on the state of the D input at the moment of a rising clock edge, delayed by one clock count. The T-flip-flop, on the other hand, is a frequency divider that divides the clock input by two. This can be shown, in a series of alternating "1s", and "0s" for a input signal as:

Input 1010101...

Output 11001100110011...

Because two bits are transmitted for each one input bit, the bit rate is one-half that of the input signal, even though the time to transmit each bit is the same. Thus, the output of the T-flip-flop incorporated into Fig. 18 of Ono would cause the output signal to have a frequency or bit rate of one-half of that of the input NRZ signal.

Hence, the modified device of Ono teaches at bit rate that is one-half that of the input signal and fails to teach a comparable input and output bit rate, as is recited in the claims".

Examiner's response – First, applicant is right that "[t]he T-flip-flop, on the other hand, is a frequency divider that divides the clock input by two", that is because its only function is that it toggles itself with every clock pulse (e.g., on the leading edge). However, this property or function is exactly what the system (or phase modulator) needs so to change (or modulate) the phase of the optical NRZ signal and then get the duobinary optical signal.

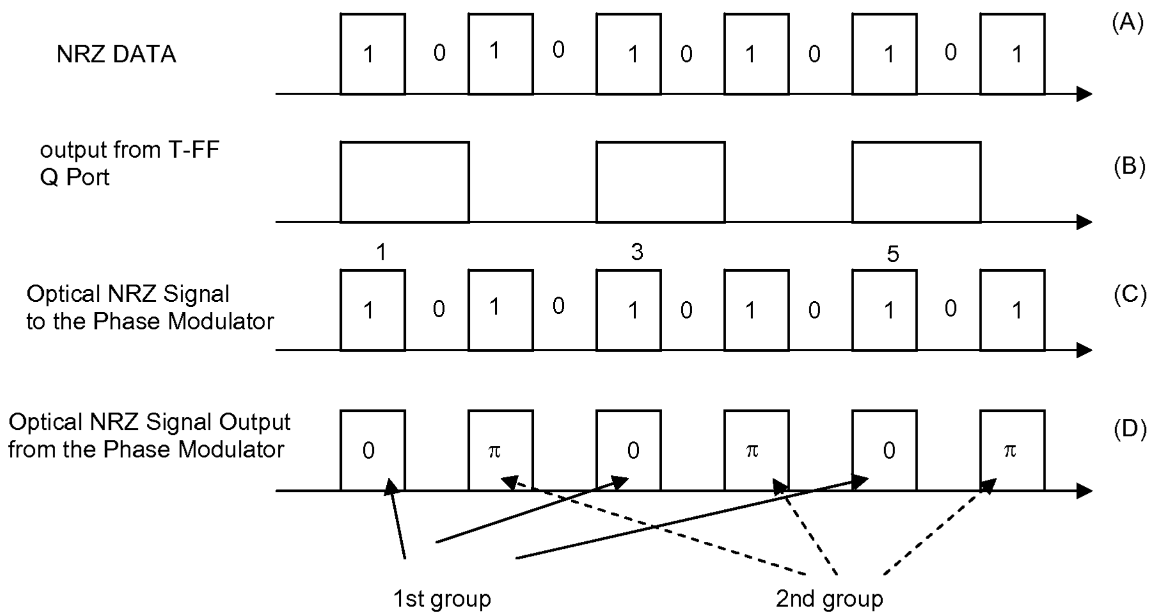
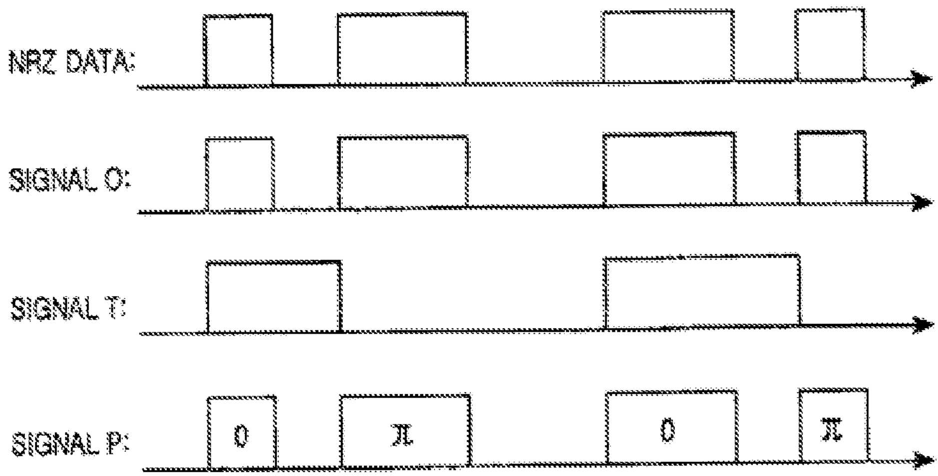


Figure O1

Refer to above Figure O1, compared to the input electrical NRZ data shown in (A) of Figure O1, the output (shown in (B) of Figure O1) from the T-FF looks "have a frequency or bit rate of one-half of that of the input NRZ signal" due to the T flip flop is triggered on the rising edge of the data signal. But, the electrical signal from the T-FF is used to control the phase modulator so to "flip" the phase of the optical NRZ signal. Figure O1 (C) is the optical NRZ signal to the phase modulator, As shown in (B) and

(C), the “1” bits in odd positions are modulated by the phase modulator with an electrical signal having intensity of high states (or “1”) from the T-FF; and the “1” bits at the even positions is modulated by the phase modulator with an electrical signal having intensity of low states (or “0”) from the T-FF. Then, as shown in (D), the phases of the “1” bits in odd positions of the phase-modulated optical NRZ signal outputted from the phase modulator have phases of 0 due to the high state of the electrical signal from the T-FF; and the phases of the “1” bits in even positions of the phase-modulated optical NRZ signal outputted from the phase modulator have phases of π due to the low state (or “0”) of the electrical signal from the T-FF. Although the electrical signal outputted from the T-FF seems “have a frequency or bit rate of one-half of that of the input NRZ signal”, the phase modulated optical signals (FigureO1 (D)) outputted from the optical phase modulator have the exactly the same bit rate as the input NRZ signals (“a comparable input and output bit rate, as is recited in the claims”), but the phase is modulated. And due to the specific type of phase modulation, a duobinary signal is generated.

Second, the signal T outputted from the applicant T-FF also “have a frequency or bit rate of one-half of that of the input NRZ signal”. Here is the Fig. 5 of applicant:



From above figure or Fig. 5 of applicant, one may not directly perceive that the "SIGNAL T" has a frequency or bit rate of one-half of that of the input NRZ signal. Now, suppose the input NRZ DATA is 1010101010, then the Fig. 5 becomes:

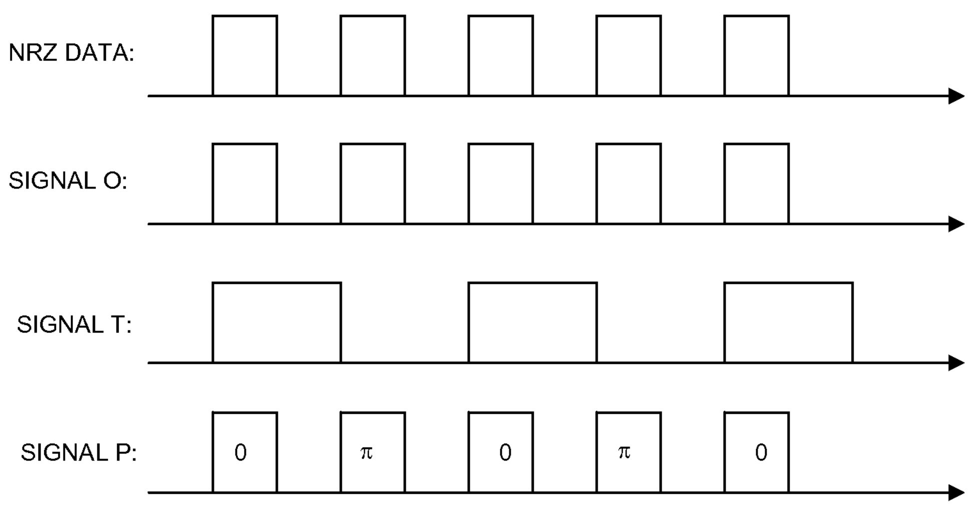


Figure O2

Figure O2 clearly shows that the SIGNAL T outputted from the T-FF has a frequency or bit rate of one-half of that of the input NRZ signal. And, Kitajima and Wei etc teach the same property or function as the applicant's T-FF has.

The combination of Ono and Kitajima and Wei etc. teaches or reasonably suggests the claim limitations.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4, 6 and 9-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ono et al (US 6,388,786) in view of Kitajima et al (US 5,515,196) and Wei et al (US 2002/0196508) and Kaiser et al (Kaiser et al, "Reduced Complexity Optical Duobinary 10-Gb/s Transmitter Setup Resulting in an Increased Transmission Distance", IEEE *Photonics Technology Letters, Vol. 13, No. 8, August 2001, pages 884-886*).

1). With regard to claim 1, Ono et al discloses a duobinary optical transmission apparatus (Figures 8, 13, 15 and 23 etc, ABSTRACT) comprising:

a light source (Semiconductor Laser 1 in Figure 8, 13, 15 and 23) for outputting an optical carrier;

a Non-Return to Zero (NRZ) optical signal generating section (Optical Intensity Modulator 2 in Figures 8, 13, and 23, or 19 in Figure 15) configured to receive an NRZ electrical signal, and for modulating the optical carrier from the light source into an NRZ optical signal according to said NRZ electrical signal (column 7, line 3-30); and

a duobinary optical signal generating section (Optical Phase Modulator 3 in Figures 8, 13 and 23, or 19 in Figure 15) configured to receive said NRZ electrical signal and modulating said NRZ optical signal into a duobinary optical signal (column 7, line 10-30, and column 8 line 45-57); the duobinary optical signal generating section comrpsing:

a pair of second amplifiers (Ono et al teaches that the amplifiers can be used to amplify the electrical driving signals, e.g., Driving amplifiers 21 in Figure 15, also refer to Figures 1 and 2) for amplifying and outputting the driving signals from the precoder;

a second interference type optical phase modulator (Optical Phase Modulator 3 in Figures 8, 13, 15 and 23) for modulating a phase of said NRZ optical signal according to driving signals from said pair of second amplifiers.

But, Ono et al teaches a precoder for processing the NRZ electrical signal, Ono et al does not expressly disclose the duobinary optical generating section comprises: a T-flip-flop, having a first and second output port, for separating by received “1” bit values of the inputted NRZ electrical signal into first and second groups, wherein said first group of "1" bits values has a first phase and said second group of "1" bits has a second phase different than that of the phase of the first group of "1" bits and said first group of "1" bits and said second group of "1" bits have a bit rate comparable to the NRZ signal.

However, the T-flip-flop circuit has been widely used in the art to precode or encode the inputted signal. Kitajima et al, in the same field of endeavor, teaches a T-flip-flop (Figure 8, column 9, line 55 to column 10 line 5), having a first output port (the output 17-a in Figure 8A), for separating by received “1” bit values of the inputted NRZ

electrical signal into first (see Figure O3, the shaded “1”, e.g., shown in positions 1 and 3) and second groups (see Figure O3, the un-shaded “1”, e.g., shown in position 2).

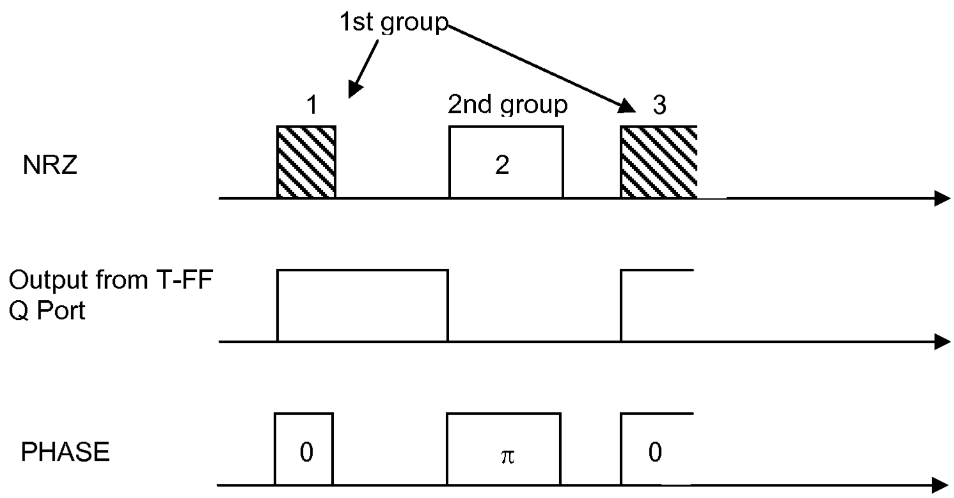


Figure O3

Kitajima et al teaches that the T flip-flop 18-a is triggered in response to a **rise-up edge** of the input signal to thereby produce an output signal having a waveform such as illustrated in FIG. 8B at row 2 (column 9 line 55-67), therefore, the odd group of “1” is separated into the “first group”, and the even group of “1” is separated into the “second group”; and first group of “1” is “represented” by the electrical signal with intensity of “1” in the output of T-FF Q-Port, the second group of “1” is “represented” by the electrical signal with intensity of “0” in the output of T-FF Q-Port. And Wei et al also teaches a T-FF circuit to drive a phase modulator (Figure 16 and Figure 10, [0081]), and the T-FF has a first output port (the 1608 in Figure 16) and second output port (the 1610 in Figure 16), for separating by received “1” bit values of the inputted NRZ electrical signal into first and second groups (refer to the output 1608 in Figure 16).

And another prior art, Kaiser et al, discloses that by a toggle flip-flop (T-FF), no external feedback is required since the recursion is an integral function of the T-FF, and the T-FF structure using only feed forward building blocks avoids all problems with implementation and adjustment. Besides, an upgrade to higher bit rates of a single-chip integration can be done straightforwardly.

And, Ono et al also teaches a D Flip-Flop (D-FF) combined with a precoder. Ono et al uses the two outputs (Q and Q-bar) to drive a single optical modulator (e.g., Figures 18 and 22) to get both intensity modulation and phase modulation so to generate a duobinary optical signal. It is well known to one skilled in the art that a T flip-flop can also be built using D flip-flop.

And Ono et al also teaches that the phase of the output signal from the duobinary modulators depends on the drive signal from the precoder and the phase different is 'π' (column 7, line 10-13, the LN optical phase modulator modulates the optical phase into π or 0 according to the value, 1 or 0, of an electrical signal to be input). And Wei et al teaches to use the output from the T-FF to drive the phase modulator. Therefore, it would be obvious to one skilled in the art to use the two outputs from a T-FF, and amplify the two outputs from the T-FF to a desired voltage, to drive the optical phase modulator, and then the first group of "1" bit values (e.g., the odd group of “1” in Figures O1 and O3 above) has a first phase (e.g., phase 0) and the second group of "1" bits (e.g., the even group of “1” in Figures O1 and O3 above) has a second phase (e.g., phase π) different than that of the phase of the first group of "1" bits and said first group of "1" bits and said second group of "1" bits have a bit rate comparable to the NRZ

signal (ref. to Figure O1 (D), or the third row of Figure O3, the two group of "1" bits have a bit rate comparable to the NRZ signal). And, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the T-FF as taught by Kitajima et al and Wei et al and Kaiser et al to the system of Ono et al so that a simple structure T-FF without feedback tap can be obtained, and an upgrade to higher bit rates of a single-chip integration can be made easier.

2). With regard to claim 2, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claim 1 above. And Ono et al further discloses Ono et al further discloses wherein the light source comprises a laser diode (Semiconductor Laser 1 in Figure 8, 13 and 23).

3). With regard to claim 3, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claim 1 above. And Ono et al further discloses wherein the NRZ optical signal generating section comprises a pair of first modulator driving amplifiers (Driving amplifiers 21 in Figure 15) for amplifying and outputting the NRZ electrical signal, and a first interferometer type optical intensity modulator (Optical Intensity Modulator in Figures 8, 13, 15 and 23) for modulating an intensity of said optical carrier according to driving signals inputted from said pair of first modulator driving amplifiers.

4). With regard to claim 4, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claims 1 and 3 above. And Ono et al further discloses wherein said first interferometer type optical intensity modulator

comprises a Mach-Zehnder interference type optical phase modulator (Mach-Zehnder (MZ) Optical Intensity Modulator, column 7 line 4-5).

5). With regard to claim 6, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claim 1 above. And Ono et al further discloses wherein the NRZ optical signal generating section (Optical Intensity Modulator 2 in Figures 8, 13 and 23) is adapted for receiving the NRZ electrical signal from a pulse pattern generator (column 7, line 8-10).

6). With regard to claim 9, Ono et al further discloses a duobinary optical transmission apparatus comprising:

a light source (Semiconductor Laser 1 in Figure 8, 13, 15 and 23) for outputting an optical carrier;

a first modulator driving amplifier unit (Driving amplifiers 21 in Figure 15) for receiving, amplifying, and then outputting at least one NRZ electrical signal;

an optical intensity modulator(Optical Intensity Modulator in Figures 8, 13, 15 and 23) for modulating the intensity of the optical carrier according to a driving signal inputted from the first modulator driving amplifier unit;

a precoder (e.g., precoder 7 in Figures 8, 13, 15 and 23) for receiving the inputted NRZ electrical signal.

a second modulator driving amplifier unit (e.g., Driving amplifiers 21 in Figure 15) for amplifying and outputting at least one signal outputted from the precoder; and

an optical phase modulator (Optical Phase Modulator 3 in Figures 8, 13, 15 and 23) for modulating the phase of the NRZ optical signal according to at least one driving signal transmitted from the second modulator driving amplifier unit.

But, Ono et al teaches a precoder for processing the NRZ electrical signal, Ono et al does not disclose a T-flip-flop, having a first and second output port, separating '1' bit values of the NRZ electrical signal into first and second groups of "1" bit values, and after the phase modulator, wherein said first group of "1" bit values has a first phase associated with a first output of the first output port and said second group of "1" bit values has a second phase associated with the second output of the first output port and said first group of "1" bits and said second group of "1" bits have a bit rate comparable to the NRZ signal.

However, the T-flip-flop circuit has been widely used in the art to precode or encode the inputted signal. Kitajima et al, in the same field of endeavor, teaches a T-flip-flop (Figure 8, column 9, line 55 to column 10 line 5), having a first output port (the output 17-a in Figure 8A), for separating by received "1" bit values of the inputted NRZ electrical signal into first (see Figure O3, the shaded "1", e.g., shown in positions 1 and 3) and second groups (see Figure O3, the un-shaded "1", e.g., shown in position 2). Kitajima et al teaches that the T flip-flop 18-a is triggered in response to a **rise-up edge** of the input signal to thereby produce an output signal having a waveform such as illustrated in FIG. 8B at row 2 (column 9 line 55-67), therefore, the odd group of "1" is separated into the "first group", and the even group of "1" is separated into the "second group"; and the first group of "1" is "represented" by the electrical signal with intensity of

"1" in the output of T-FF Q-Port, the second group of "1" is "represented" by the electrical signal with intensity of "0" in the output of T-FF Q-Port. And Wei et al also teaches a T-FF circuit to drive a phase modulator (Figure 16 and Figure 10, [0081]), and the T-FF has a first output port (the 1608 in Figure 16) and second output port (the 1610 in Figure 16), for separating by received "1" bit values of the inputted NRZ electrical signal into first and second groups (refer to the output 1608 in Figure 16).

And another prior art, Kaiser et al, discloses that by a toggle flip-flop (T-FF), no external feedback is required since the recursion is an integral function of the T-FF, and the T-FF structure using only feed forward building blocks avoids all problems with implementation and adjustment. Besides, an upgrade to higher bit rates of a single-chip integration can be done straightforwardly.

And, Ono et al also teaches a D Flip-Flop (D-FF) combined with a precoder. Ono et al uses the two outputs (Q and Q-bar) to drive a single optical modulator (e.g., Figures 18 and 22) to get both intensity modulation and phase modulation so to generate a duobinary optical signal. It is well known to one skilled in the art that a T flip-flop can also be built using D flip-flop.

And Ono et al also teaches that the phase of the output signal from the duobinary modulators depends on the drive signal from the precoder and the phase different is 'π' (column 7, line 10-13, the LN optical phase modulator modulates the optical phase into π or 0 according to the value, 1 or 0, of an electrical signal to be input). And Wei et al teaches to use the output from the T-FF to drive the phase modulator. Therefore, it would be obvious to one skilled in the art to use the two outputs from a T-FF to drive the

optical phase modulator, and then the first group of "1" bit values (e.g., the odd group of “1” in Figures O1 and O3 above) has a first phase (e.g., phase 0) associated with the output of the phase modulator and the second group of "1" bit values (e.g., the even group of “1” in Figures O1 and O3 above) has a second phase (e.g., phase π) associated with the output of the phase modulator, and said first group of "1" bits and said second group of "1" bits have a bit rate comparable to the NRZ signal (ref. to Figure O1 (D), or the third row of Figure O3, the two group of "1" bits have a bit rate comparable to the NRZ signal), so to obtain the duobinary signal. And, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the T-FF as taught by Kitajima et al and Wei et al and Kaiser et al to the system of Ono et al so that a simple structure T-FF without feedback tap can be obtained, and an upgrade to higher bit rates of a single-chip integration can be made easier.

7). With regard to claim 10, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claim 9 above. And Ono et al further discloses wherein each of the optical intensity modulator and the optical phase modulator comprises a Mach-Zehnder interferometer type optical modulator (Mach-Zehnder (MZ) Modulator, column 7 line 4-7).

8). With regard to claim 11, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claims 9 and 10 above. And Ono et al further discloses wherein the Mach-Zehnder interferometer type optical modulator is a dual-armed Z-cut Mach-Zehnder interferometer type optical modulator (Figure 15, the dual-armed Z-cut MZ modulators are used).

9). With regard to claim 12, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claims 9-11 above. And Ono et al further discloses wherein each of the first and second modulator driving amplifier units includes a pair of modulator driving amplifiers (Driving amplifiers 21 in Figure 15), each of which amplifies the NRZ electrical signal inputted to itself.

10). With regard to claim 13, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claims 9 and 10 above. And Ono et al further discloses wherein the Mach-Zehnder interferometer type optical modulator is a single-armed X-cut Mach-Zehnder interferometer type optical modulator (e.g., Figure 8, the Mach-Zehnder modulator is the LN X-cut single-armed modulator).

11). With regard to claim 14, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claim 9 above. And Ono et al in view of Kitajima et al and Kaiser et al discloses wherein the first group of `1` in the sequence and the second group of `1` in the sequence have been separated from the NRZ electrical signal, respectively (Ref to Figure O3).

But, Ono et al does not expressly disclose wherein the first group of `1` bit values in the sequence and the second group of `1` bit values in the sequence have a phase difference of 'π' with respect to each other.

As shown in Figure O3, Kitijma et al and Wei et al teaches that the T-flip-flop separating by received "1" bit values of the inputted NRZ electrical signal into first (see Figure O3, the shaded "1", e.g., shown in positions 1 and 3) and second groups (see Figure O3, the un-shaded "1", e.g., shown in position 2), that is, the group of `1` in odd

positions in the sequence and the group of `1` in even positions in the sequence are separated from the NRZ electrical signal, respectively; and first group of “1” is “represented” by the electrical signal with intensity of “1” in the output of T-FF Q-Port, the second group of “1” is “represented” by the electrical signal with intensity of “0” in the output of T-FF Q-Port. And Ono et al also teaches that the phase of the output signal from the duobinary modulators depends on the drive signal from the precoder and the phase different is ‘π' (column 7, line 10-13, the LN optical phase modulator modulates the optical phase into π or 0 according to the value, 1 or 0, of an electrical signal to be input). And Wei et al teaches to use the output from the T-FF to drive the phase modulator. Refer to Figure O3, the drive signal for the first group is different from the drive signal for second group, therefore, it would be obvious that the first group of `1` in the sequence and the second group of `1` in the sequence have a phase difference of ‘π’ with respect to each other.

12). With regard to claim 15, Ono et al discloses a method for duobinary optical transmission comprising the steps of:

(a) outputting a light source as an optical carrier (Semiconductor Laser 1 outputs a light source, Figure 8, 13 and 23);

(b) receiving an NRZ electrical signal (Optical Intensity Modulator 2 receives an NRZ electrical signal, Figures 8, 13 and 23) and modulating the optical carrier from the light source into an NRZ optical signal according to said NRZ electrical signal by providing a Non-Return to Zero (NRZ) optical signal generating section (column 7, line 3-30); and

(c) receiving said NRZ electrical signal (Optical Phase Modulator 3 receives NRZ electrical signal, Figures 8, 13 and 23) and modulating said NRZ optical signal into a duobinary optical signal by a duobinary optical signal generating section signal (column 7, line 10-30), each phase associated with a phase generating signal (column 7, line 1-13, the LN optical phase modulator modulates the optical phase into π or 0 according to the value, 1 or 0, of an electrical signal to be input).

But, Ono et al teaches a precoder for processing the NRZ electrical signal, Ono et al does not expressly disclose separating ‘1’ bit values in the sequence of the NRZ electrical signal into a first and second group of ‘1’ bit values, and the duobinary optical signal generating section associates each element of said first group of ‘1’ bit values with a first phase and each element of said second group of ‘1’ bit values with a second phase, and said first group of "1" bits and said second group of "1" bits have a bit rate comparable to the NRZ signal.

However, Kitajima et al, in the same field of endeavor, teaches a T-flip-flop (Figure 8, column 9, line 55 to column 10 line 5), for separating “1” bit values in the sequence of the NRZ electrical signal into first (see Figure O3, the shaded “1”, e.g., shown in positions 1 and 3) and second (see Figure O3, the un-shaded “1”, e.g., shown in position 2) groups of ‘1’ bit values. Kitajima et al teaches that the T flip-flop 18-a is triggered in response to a **rise-up edge** of the input signal to thereby produce an output signal having a waveform such as illustrated in FIG. 8B at row 2 (column 9 line 55-67), therefore, the odd group of “1” is separated into the “first group”, and the even group of “1” is separated into the “second group”; and first group of “1” is “represented” by the

electrical signal with intensity of “1” in the output of T-FF Q-Port, the second group of “1” is “represented” by the electrical signal with intensity of “0” in the output of T-FF Q-Port. And Wei et al also teaches a T-FF circuit to drive a phase modulator (Figure 16 and Figure 10, [0081]), and the T-FF has a first output port (the 1608 in Figure 16) and second output port (the 1610 in Figure 16), for separating by received “1” bit values of the inputted NRZ electrical signal into first and second groups (refer to the output 1608 in Figure 16).

And another prior art, Kaiser et al, discloses that by a toggle flip-flop (T-FF), no external feedback is required since the recursion is an integral function of the T-FF, and the T-FF structure using only feed forward building blocks avoids all problems with implementation and adjustment. Besides, an upgrade to higher bit rates of a single-chip integration can be done straightforwardly.

And Ono et al also teaches that the phase of the output signal from the duobinary modulators depends on the drive signal from the precoder and the phase different is ‘π' (column 7, line 10-13, the LN optical phase modulator modulates the optical phase into π or 0 according to the value, 1 or 0, of an electrical signal to be input). And Wei et al teaches to use the output from the T-FF to drive the phase modulator. Therefore, it would be obvious to one skilled in the art to use the two outputs from a T-FF to drive the optical phase modulator, and then each element of the first group of "1" bit values (e.g., the odd group of “1” in Figures O1 and O3 above) has a first phase (e.g., phase 0) and each element of the second group of "1" bit values (e.g., the even group of “1” in Figures O1 and O3 above) has a second phase (e.g., phase π), so to obtain the

duobinary signal, and the first group of "1" bits and the second group of "1" bits have a bit rate comparable to the NRZ signal (ref. to Figure O1 (D), or the third row of Figure O3, the two group of "1" bits have a bit rate comparable to the NRZ signal). And, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the T-FF as taught by Kitajima et al and Wei et al and Kaiser et al to the system of Ono et al so that a simple structure T-FF without feedback tap can be obtained, and an upgrade to higher bit rates of a single-chip integration can be made easier.

13). With regard to claim 16, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claim 15 above. And Ono et al further Ono et al further discloses wherein the light source used in step (a) comprises a laser diode (Semiconductor Laser 1 in Figure 8, 13 and 23).

14). With regard to claim 17, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claim 15 above. And Ono et al further discloses wherein the NRZ optical signal generating section used in step (b) comprises a pair of first modulator driving amplifiers (Driving amplifiers 21 in Figure 15) for amplifying and outputting the NRZ electrical signal, and a first interferometer type optical intensity modulator (Optical Intensity Modulator in Figures 8, 13, 15 and 23) for modulating an intensity of said optical carrier according to driving signals inputted from said pair of first modulator driving amplifiers.

15). With regard to claim 18, Ono et al and Kitajima et al and Wei et al and Kaiser et al disclose all of the subject matter as applied to claim 15 above. And Ono et

al further discloses wherein said first interferometer type optical intensity modulator comprises a Mach-Zehnder interference type optical phase modulator (Mach-Zehnder (MZ) Optical Intensity Modulator, column 7 line 4-5).

16). With regard to claim 19, Ono et al and Kitajima et al and Wei et al and Kaiser et al discloses all of the subject matter as applied to claim 15 above. And Ono et al and Kitajima et al and Wei et al and Kaiser et al further teach wherein the duobinary optical generating section used in step (c) comprises a T-flip-flop for generating said phase generating signal from said inputted NRZ electrical signal (Kitajima et al Figure 8 and Wei et al Figure 16 teach the T-flip-flop circuit to generate the phase generating signal); a pair of second amplifiers (Ono et al: Driving amplifiers 21 in Figure 15) for amplifying and outputting the signal from the precoder; and a second interference type optical phase modulator (Ono et al: Optical Phase Modulator 3 in Figures 8, 13, 15 and 23) for modulating a phase of said NRZ optical signal according to driving signals from said pair of second amplifiers.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LI LIU whose telephone number is (571)270-1084. The examiner can normally be reached on Mon-Fri, 8:00 am - 5:30 pm, alternating Fri off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571)272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Li Liu
July 25, 2008

/Kenneth N Vanderpuye/
Supervisory Patent
Examiner, Art Unit 2613